

Using of Comic-Based Supplementary Material in Enhancing Students' Engagement and Food Preservation Competencies

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ABSTRACT

The study assessed the relationship between students' engagement and Grade 6 Food Processing students' competencies concerning their perception of the comic-based supplementary material. Technology and Livelihood Education (TLE) has minimal studies about such concepts, so further research is needed. A description-correlation research method involving 30 Grade 6 students and a researcher-made questionnaire was utilized in data gathering. The findings revealed that the comic material was positively recognized by the students with an overall mean of 4.76 with a verbal interpretation of "strongly agree," while the overall mean of perceived student engagement after using the instructional material was 4.72, with the category "highly engaged" reflects that the material helped the learners to be engaged in learning the subject. Furthermore, the relationship between the perception of the use of comic material and engagement was significant, with a high positive correlation $r=0.82$. It implies that as students utilized the comic material, their engagement increased. Similarly, it was found that student's perception of the comic material was partially significant to their competencies with moderate association $r=.39$. This is because of the non-significant result of the correlation between the comic and other variables in competencies such as content, presentation, and accuracy. Nonetheless, the material still contributed to learners' acquisition of acceptable grades in Food Preservation 6.

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1. INTRODUCTION

Education is very significant in the lives of learners in any situation. Instructional resources in learning are one of the most important factors in delivering high-quality education. However, making learning material engaging is still a challenge today as the needs and situations of the students vary. Recently, the challenge of providing engaging materials intensified. In the Philippines, the reported 8.8 million registrants for 2020-2021

under blended learning is not an exemption [1]. The study of Acala & Castroverde [2] reported that there are unanswered modules given to teachers, which indicates the students' apathetic attitude toward the learning processes. As a result, Gueta & Janer [3] stated that teachers had been forced to rethink how students can be engaged in distance learning, and one of the primary solutions is providing more engaging resources. Today, as face-to-face classes are under operation again, the call for innovative instructional materials that may boost students' engagement in learning is still a concern. Consequently, this paper sought to determine the relationship between learning material and its effect on students' engagement and competencies.

Student engagement generally refers to how much a student actively engages with course material, fellow students, and the instructor by thinking, discussing, and interacting [4]. The study of Dixson [4] includes several variables such as skills engagement (what they "do"); emotional engagement (how connected they feel); participation engagement (engaging with others and appreciating the course/content); and performance engagement (the wish or aim of students to pass the course) which are the variables in this paper.

The supplementary material of the study was comic-based material that aimed to engage young learners in face-to-face classes [5]–[9]. Comics is a narrative and visual art form that permits a reference to an act's progress by going from one picture to another without disrupting its sequence through a series of drawings supported by text [10]. The Comic material is claimed to be effective in students' learning. Aleixo & Sumner [11] agreed that comics with relevant visuals could improve learning. However, comic material in Food preservation is minimal. The indicators of comic material include (1) content, (2) instructional quality, (3) technical quality, (4) storyline, (5) interactivity and feedback, (6) presentation and organization, (7) accuracy and up-to-dateness information, and (8) assessment [12].

The study of Affeldt et al. [8] used printed comics in practical instructions in a non-formal Chemistry learning context as the inspiration. Nonetheless, Affeldt et al. [13] stated that available knowledge of learning about comics suggests using it in instructions for it may improve students' access to and comprehension of practical works, which is quite similar in the Food Preservation area. Moreover, minimal non-formal laboratory-based science learning courses, as, e.g., described in Eilks et al. [14] and Affeldt et al. [15], discussed using comics in demanding practical tasks, did not share research on using comics from a student perspective. Though somewhat the same as science laboratory practices, practical disciplines such as Technology and Livelihood Education (TLE) have minimal studies about such concepts, so further research is needed. More so, Casumpang & Enteria [16] agreed that there is a need for further research on comic strips across different disciplines. Hence this study was intended to investigate how interactive comic-based supplementary material may effectively engage and develop students' competencies in Technology and Livelihood Education (TLE), specifically in Food Preservation.

The goal in the creation of innovative learning material is a contribution to PAKYAW-ONE in CID TANAUAN, a Divisional Assessment Matrix for Curriculum Integration in response to Memorandum OUCI -2020-307 entitled Suggested Measures to Foster "Academic Ease" During the COVID-19 Pandemic and DepEd Order No. 31, s.

2020 Interim Policy Guidelines for Assessment and Grading in the Light of BE - LCP. The research was intended to improve the engagement and learning performance in Food Preservation of 30 Grade 6 students of Dr. Alcantara Elementary School during new regular education.

2. METHOD

The researcher utilized a descriptive-correlational research design method to assess the relationship between students' engagement and competencies of Grade 6 Food Processing students at Dr. Alcantara Elementary School in relation to their perception of the comic-based supplementary material. The study utilized a purposive sampling technique with 30 respondents. Its sample is a non-probability sample that is selected based on population characteristics and the study's objective [17]. The researcher used a self-made survey instrument to gather the study's data and information. A summative test aligned with Food Preservation competencies was also employed to measure the learners' performance before and after utilizing the material. The questionnaires contain two parts. Part I, the perception of students in utilization of the comic-based supplementary material (content, instructional quality, technical quality, storyline, (5) interactivity, feedback, presentation, organization, accuracy, and up-to-dateness information, and assessment), each item respondents indicated their perception in the use of comic-based supplementary material using five-point Likert scale (5 = Strongly Agree 4 = Agree; 3 = Moderately Agree; 2 = Slightly Agree; and 1: Disagree). While Part II, the assessment of students' engagement after the utilization of materials (skills, emotional, participation, and performance), respondents then assessed their engagement in the use of comic-based supplementary material with the use Five-point Likert scale (5= Highly Manifested; 4 = Manifested; 3 = Moderately Manifested; 2 = Slightly Manifested; and 1: Not Manifested).

After the research proposal was approved, the comic material, questionnaires, and teacher-made tests were refined and validated. The comic-based supplementary material in Food Preservation was checked and validated by the TLE coordinator and master teacher using evaluation Instruments from Deped Memo No. 441, s. 2019 (Guidelines and Process for LRMS) with recommendable results [18]. Meanwhile, the questionnaires were also validated by the same committee. The validation of the two experts resulted in an S-CUI (scale-level content validity index on average method) of 0.89, which implied an acceptable CVI (content validity index) value. Thus, the indicators of the instrument are relevant to the study's variables.

The results of the instruments of the 20 pilot respondents were tallied and submitted to the statistician for treatment, analysis, and interpretation of data for validity, reliability, and internal consistency of questionnaires. Thus items gathered an acceptable Cronbach result of .945 in perception and .909 in engagement. After the refinement and utilization of the material and questionnaires, After the refinement of the material and questionnaire, the researcher sought the approval of the panel members and the Dean of Graduate Studies and Applied Research to administer the study. Then, the researcher asked permission from the office of the school principal of Dr. Alcantara Elementary School in Mabini, Tanauan City, Batangas, to conduct the study. After the approval, the

researcher disseminated the comic material to the 30 respondents and let them utilize it for three weeks, from December 2022 to January 2023, respectively. After a while, summative assessments and questionnaires were distributed. Data was processed after the instruments were retrieved and handled by the statistician. Interpretation of data was treated statistically to interpret findings. The following tools were employed to answer the questions and to serve as basis in the analysis and interpretation of the data: Frequency and percentage were used in determining the distribution of responses in perception, engagement, and summative results; Mean and standard deviation was used in determining the perception of the respondents regarding comic-based supplementary material in teaching Food Preservation and measuring the engagement; and Pearson r was used in determining the relationship between the perception of comic-based supplementary material to students' engagement and Food Preservation competencies.

3. RESULTS AND DISCUSSION

3.1. This study section focuses on students' perception of using comic-based learning material in Food Preservation 6.

Table 1. Students' Perception in the Utilization of Comic-Based Supplementary Material

Indicators	\bar{x}	SD	Verbal Interpretation
Content	4.68	0.50	Strongly Agree
Instructional Quality	4.74	0.27	Strongly Agree
Technical Quality	4.82	0.37	Strongly Agree
Storyline	4.70	0.39	Strongly Agree
Interactivity and Feedback	4.68	0.48	Strongly Agree
Presentation and Organization	4.90	0.22	Strongly Agree
Accuracy and Up-To-Dateness of Information	4.82	0.29	Strongly Agree
Assessment	4.73	0.40	Strongly Agree
Overall	4.76	0.37	Strongly Agree

Legend: 4.21 – 5.0 Strongly Agree 3.41 – 4.20 Agree 2.61 – 3.40 Moderately Agree
 1.81 – 2.60 Slightly Agree 1.0 – 1.80 Disagree

Table 1 displays the overall mean of the evaluated instructional material. According to the table, the total mean is 4.76, with a verbal explanation. "Strongly Agree" implies a favorable assessment of the respondents. A similar result was revealed in the study by Mamolo [7] about Digital Interactive Math Comics (DIMaC) as assessed by 38 students. The overall usability is high, with $M = 4.14$ and $SD = 0.50$. More so, Affeldt et al. [8] study on students' impressions of employing comic-based lab instruction in non-formal classes in the field of water quality chemistry discovered a favorable perception. Of the Nine (9) variables, the interpretation "strongly agree" had the highest mean of 4.90, showing that the comic has an excellent presentation and organization, while the lowest mean of 4.62, but still with an interpretation "strongly agree" were indicators 1 and 5. The result implies that the researcher should concentrate more on content, interactivity, and feedback to provide quality material.

3.2. Student Engagement after the Utilization of the Comic-Based Supplementary Material.

This study section focuses on student engagement after utilizing comic-based supplementary material.

Table 2. Perceived Student Engagement

Indicators	\bar{x}	SD	Verbal Interpretation
Skill	4.76	0.32	Highly Engaged
Emotional	4.77	0.32	Highly Engaged
Participation	4.61	0.51	Highly Engaged
Performance	4.73	0.35	Highly Engaged
Overall	4.72	0.38	Highly Engaged

Legend: 4.21 – 5.0 *Highly Engaged* 3.41 – 4.20 *Engaged* 2.61 – 3.40 *Moderately Engaged*
 1.81 – 2.60 *Slightly Engaged* 1.0 – 1.80 *Not at all Engaged*

The overall mean of the perceived student engagement after utilizing the instructional material is shown in Table 2. The total mean, as shown in the table, is 4.72, with a "highly engaged" interpretation indicating a good result. This implies that the material helped the students learn the Food preservation competencies. The interpretation "highly engaged" had the highest mean of 4.77 under emotional engagement out of the four (4) indicators. The result revealed that the comic material, designed to attend to students' needs, helped the students be engaged emotionally. This conforms to the study of Wilson [19], stating that developing a learning environment focused on the needs of the students and fostering positive interpersonal interactions increase emotional engagement. In addition, Burkholder & Pentaraki [20] claims that emotional engagement is the primary factor influencing how students engage cognitively and behaviorally. So, it is crucial to get students' affective domain involved.

Meanwhile, variable three, participation engagement, had the lowest mean of 4.61, but still with an interpretation of "highly engaged." The result implies that the comic requires more collaborative activities to strengthen the students' behavioral engagement. This also suggests that comic material should increase peer interaction, not mainly with the materials and the teacher. According to DiLoreto and Gray [21], students felt more fulfilled when they cooperated and interacted with their peers and experienced significant learning gains.

The Pearson product correlation between comic-based supplementary material and student engagement is presented in Table 3. The correlation of comic-based supplementary material and students' skill engagement was highly correlated and statistically significant regarding content $r=.605$, instruction $r=.641$, interactivity $r=.699$, and accuracy $r=.719$. More so, other data reveals a moderate correlation and significant relationship of skill engagement to indicators such as technical $r=.559$, storyline $r=.500$, presentation $r=.402$, and assessment $r=.601$. This proves that the comic-based supplemental material points towards an improvement in the students' skill involvement.

Table 3. Significant Relationship Between the Perception of the Use of Comic-Based Supplementary Material and the Engagement of Grade 6 Students

Comic-Based Supplementary Material	Engagement			
	Skill	Emotional	Participation	Performance
Content	.605**	.494**	.363*	.650**
Instruction	.641**	.741**	.794**	.660**
Technical	.559**	.605**	.436*	.511**
Storyline	.500**	.684**	.606**	.533**
Interactivity	.699**	.779**	.749**	.725**
Presentation	.402*	.526**	.694**	.484**
Accuracy	.719**	.853**	.766**	.840**
Assessment	.601**	.709**	.627**	.565**

** . Correlation is significant at the 0.01 level (2-tailed).

Good content increases the students' cognitive engagement as the enormous amount of information from the modules has been broken down into manageable chunks in the supplementary material. This conforms to Lawson & Lawson's [22] explanation of how students interpret the information using academic material, which affects students' skill engagement. Also, according to Ravelo [23], reading comics allows the reader to become fully engaged in reading. Thus, comic material is observed to have the capacity to increase cognitive engagement.

Table 3 also shows the relationship between comic-based supplemental material and emotional engagement. The data shows that emotional engagement strongly correlates to comic-based supplementary material such as instruction $r=.741$, technical $r=.605$, storyline $r=.684$, interactivity $r=.779$, accuracy $r=.853$, and assessment $r=.709$, respectively. Moreover, the rest of the relationships got a moderate correlation result, such as content $r=.494$ and presentation $r=.526$. This shows that the comic-based supplemental material increases the students' emotional involvement.

The findings of Table 3, which examined the connection between comic-based supplementary material and students' emotional engagement, are significantly connected. This reveals that the comic material helped the students to be emotionally connected. The exciting features of the comic material compared to the regular learning materials made the students have fun learning, thus creating a good result. Students' emotional involvement, defined as emotive reactions to the course contents and pleasure of the course material, explains why people become interested in a subject and, like making connections or learning new things, supports the result [4].

Meanwhile, the table further reveals the relationship between comic-based supplemental material and participation engagement. The Pearson product correlation of participation engagement and comic indicators such as instruction $r=.794$, storyline $r=.606$, interactivity $r=.749$, presentation $r=.363$, accuracy $r=.766$, and assessment $r=.627$ were shown to be highly associated and statistically significant. In addition, the association of participation engagement and comic indicators such as content $r=.363$ and technical $r=.436$

were moderately related and statistically significant. This explains that the comic-based supplementary material prompts students' participation and engagement.

The results of Table 3 further reveal that the comic material aided the students in behaving well in class and attending class. The comic material made the students appreciate the course and increased participation. Hence, essential to lessen absenteeism. Behavioral engagement, which refers to the specific behavioral acts students exhibit to show their motivation to participate in classroom activities and their willingness to master difficult subjects, is the term used to describe the student's interest in their educational course [24]–[26]. Other factors show that school and classroom circumstances, such as using materials, are associated with behavioral engagement because of the positive effects on student achievement, performance and decreased student dropout rates [19].

On the other hand, Table 3 also reveals the connection between comic-based supplementary material and performance engagement. With regards to the relationship between performance engagement and comic-based supplemental material, the data revealed that there were strong correlations and significant relationships in the following: content $r=.650$, instruction $r=.660$, interactivity $r=.725$, and accuracy $r=.840$ with the highest association result among the statistics. The relationship between accuracy and performance shows that precise information will lead to greater achievements. Meanwhile, the statistics show a moderate correlation between performance engagement and technical $r=.511$, storyline $r=.533$, presentation $r=.484$, and assessment $r=.565$ indicators of the comic material. This describes that content and instruction of comic-based supplemental material improves the students' performance engagement.

The findings reveal that the comic material has improved students' performance engagement. This can be subjected to the feature of the comic material, where activities are designed to enhance students' eagerness to score better for the following scenes. Cannata et al. [19] state that comic strip as instructional material positively affects the learner's performance because they can easily understand topics in picture diagram in subjects like Physics.

In general, the perception of the use of comic-based supplementary material and engagement of Grade 6 students was significant. The association of the two was positively correlated, thus implying that using the material increases student engagement. The result of the research is similar to Topkaya's [27] study that asserted that instructional comics had a favorable influence on academic success in the Social Science topic. Also, the Digital Interactive Math Comics (DIMaC) that was based on the least learned competency of Senior high school students in General Mathematics got an excellent usability of DIMaC as rated by students upon deployment of instruction, and useful in the classroom, easy to use, can be easily learned and satisfying [7]. Hence, it is believed that the comic material offers straightforward, high-quality, and interesting information on food preservation.

Meanwhile, the Pearson product correlation of comic-based supplementary material and competencies in Food Preservation is shown in Table 4. The data reveals that all of the indicators of comic material have significant relationships and were positively correlated to ways competencies except with content where $r=0.337$. This shows that the content of comic-based supplementary does not significantly affect the competencies in Food Preservation in terms of ways. This might be since the comics' content in ways was too short and too simple.

Table 4. Significant Relationship Between Perception of Students in Comic-Based Supplementary Material and Their Competencies in Food Preservation

Comic-Based Supplementary Material	Competencies					
	Ways	Tools and Equipment	Application	Research	Assessment	Market
content	0.337	0.329	.412*	.493**	0.331	.592**
instruction	.527**	.555**	.585**	.701**	.533**	.756**
technical	.611**	.547**	0.281	.690**	.608**	.538**
storyline	.473**	.528**	0.257	.700**	.520**	.596**
interactivity	.659**	.623**	.426*	.671**	.599**	.717**
presentation	.558**	.404*	0.301	.424*	0.328	.642**
accuracy	.415*	.416*	0.332	.681**	.493**	.620**
assessment	.653**	.592**	0.230	.605**	.473**	.649**

** . Correlation is significant at the 0.01 level (2-tailed).

Other indicators of comic material associated with ways competency have a strong positive connection, technical $r=.611$, interactivity $r=.659$, and assessment $r=.653$. More so, the rest of the indicators of comic material associated with ways were significantly linked with instruction $r=.527$, storyline $r=.473$, presentation $r=.558$, and accuracy $r=.415$, with moderate correlation. This shows that the comic-based supplementary material indicators, such as instruction, technical, storyline, interactivity, presentation, accuracy, and assessment, lead to an increase in Food Preservation competencies in terms of ways.

Table 4 also presents the relationships between interactivity and tools and equipment competency. The data show a strong connection between comics and interactivity, where $r=.623$. While others, such as instruction $r=.555$, technical $r=.547$, storyline $r=.528$, presentation $r=.404$ and accuracy $r=.416$, and assessment $r=.592$, were significantly associated with a moderate correlation to the said competency. This demonstrates how the comic-based supplemental material indicators—instruction, technical, plot, interaction, presentation, correctness, and assessment—improve food preservation competencies regarding tools and equipment.

Meanwhile, the result shows no significant relationship between the material and content where $r=0.329$. This shows that the content of comic-based supplementary has no significant connection to ways competencies in Food Preservation. This could be because the comics' content was too simple and direct.

On the other hand, the correlation between the indicators of the comic-material and Food preservation competencies in terms of application was generally low. Regarding the connection between the rest of the comic indicators and application, the result shows a moderate correlation and significant results, content $r=.412$, instruction $r=.585$, and interactivity $r=.426$. The table also reveals no significant relationships between the variables regarding technical $r=0.281$, storyline $r=0.257$, presentation $r=0.301$, accuracy $r=0.332$, and assessment $r=0.230$. The results show that the indicators of the comic-material and application competencies do not have strong connections and may credit to

the fact that application competency is focused on actual learning skills than theoretical learning.

Furthermore, the correlation between the comic indicators and research competency was significant. The table shows a strong correlation with research competencies regarding instruction $r=.701$, technical $r=.690$, storyline $r=.700$, interactivity $r=.671$, accuracy $r=.681$ and assessment $r=.605$. More so, other indicators have moderate correlations to research, such as content $r=.493$ and presentation $r=.424$. This implies that using comic material can help increase the research competency in Food preservation 6.

In addition to the result, the Pearson product correlation of comic-based supplementary material and competencies in Food in terms of assessment reveals a moderate correlation except content $r=0.331$ and presentation $r=0.328$ with no significant result. This might be because the content of the assessment in the module was minimal. Also, the assessment presentation might be unfamiliar to the respondents since it was comic-based.

Nonetheless, the other indicators were moderately associated with assessment, such as instruction $r=.533$, storyline $r=.520$, interactivity $r=.599$, accuracy $r=.493$, and assessment $r=.473$, respectively. And highly correlated in terms of technical $r=.608$. The findings show that the comic-based supplemental material indicators—instruction, technical, plot, interactivity, correctness, and assessment—lead to a rise in food preservation competencies in terms of assessment.

Lastly, the table reveals that the correlation between the comic indicators and market competency was significant and positively correlated. The data shows a strong positive connection between variables such as instruction $r=.756$, interactivity $r=.717$, presentation $r=.642$, accuracy $r=.620$, and assessment $r=.649$ to market competency. While content $r=.592$, technical $r=.538$, and storyline $r=.596$ have a moderate connection. Hence, the use of comic-based supplementary material leads to an increase in the market competency of the students in Food preservation.

The perception of Grade 6 students' involvement with comic-based supplementary material in association with Food preservation competencies was generally regarded to be considerable. As the two were associated favorably, it can be stated that there is a partially significant relationship between the two (2) variables. However, most of the data indicate only a moderate relationship, thus implying mild support for enhancing students' competencies in Food preservation. Nonetheless, the result is still a significant contribution to other studies claiming comics as a useful tool for learning. The study agrees with Aleixo & Sumner [6] that comics with relevant visuals can be used to improve learning. Also, according to Da Silva [28], comics help pupils show a critical sense and linkages between events and conditions, which is significant in acquiring competencies. Likewise, Sari and Harahap [29] argued that comics as instructional material in science are worth to be used in learning and can increase learning achievement. Moreover, Rogayan and Dollete [30] claim that using comic strips as instructional material positively impacts learners' performance since they make complex concepts simple to understand. Therefore, using comic material to enhance competencies is a consideration.

Table 5. Significant Relationship Between the Perception of the Use of Comic-Based Supplementary Material to Engagement and Competencies

	Engagement	Competencies
Comic-Based Supplementary Material	.82**	.39*

** . Correlation is significant at the 0.01 level (2-tailed).

After analyzing all the data, the result reveals a significant relationship and high positive correlation $r=.82$ between the perception of using comic-based supplementary material and the engagement of Grade 6 students. Also, the result denotes that the perception of students in comic-based supplementary material and competencies in Food preservation is partially significant with a moderate correlation $r=.39$. The findings implied that the utilization of comic-based supplementary material helped the students engage in learning and increase their competencies in Food preservation 6.

4. CONCLUSION

The findings did not support the hypothesis that there is no significant relationship between the perception of the use of comic-based supplementary material and the engagement of Grade 6 students. Therefore, it is concluded that the hypothesis presented in this study was not sustained. More so, the hypothesis which expressed students' perception of comic-based supplementary material is not significantly related to their competencies in Food preservation was partly not supported by evidence. Therefore, it is concluded that the hypothesis stated in this research was partially accepted. This is because of the non-significant correlation between the comic material and other data in competencies such as content, presentation, and accuracy.

Based on the findings and conclusions of this study, the following recommendations are being considered: (1) Educational planners and designers may refer to this study as a guiding framework in re-shaping and developing learners' materials in Technology and Livelihood Education Grade 6.; (2) Teachers may attend training/workshop in comic writing in order to create high-quality materials that will eventually engage students in learning and help the learners be academically competent. Teachers may also collaborate to create a comic material that targets multiple objectives across disciplines and create multidisciplinary worksheets; (3) Continuous enhancement of comic-based supplementary material is necessary to be able to improve the students' engagement and performance in Food preservation 6; (4) Future researchers are encouraged to discover the most compelling comic material in in-person classes that will increase students' engagement and competencies; and (5) More research in this field is needed to adapt to the ever-changing needs of learners and the rapidly changing trends in Technology and Livelihood Education.

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